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ABSTRACT

This chapter considers methods of interface analysis, the stage in the instructional development process that involves the identification, interpretation, and prioritization of essential points of contact among systems and subsystem boundaries. The structure of interfaces, types of interfaces, interface characteristics, and a procedural model for conducting an interface analysis are presented. An example of interface analysis using an undergraduate teacher education program is provided. Thirteen figures are provided. (9 references) (Author/EW)

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Chapter 9

Interface Analysis of ID Systems

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Instructional development is a process which occurs within a system. A system exists within a context of other systems, and is in turn composed of subsystems. If the ID process is to proceed, the systems must all function. This requires that they interact; that is, information must be transmitted among them, and their behaviors must vary as a function of the information which they generate, transmit and receive. This information passes from system to system through parts called "interfaces." "Interface analysis" has to do with the identification of these parts, the measurement of their effectiveness, and their improvement.

Interface analysis is an emerging process which focuses upon the physical and conceptual boundaries among systems and subsystems. In this chapter, the case will be made that the study of these boundaries is of serious concern to instructional developers. Another term for the common boundary between systems is "interface." An interface, as defined by Webster (1966), is "a surface that lies between two parts of matter or space and forms their common boundary." This meaning will be expanded to include both physical and conceptual systems, and will encompass those interface characteristics which affect the exchange of essential information among systems, necessary for accomplishing instructional development tasks.

Instructional development systems consist of processes primarily designed to solve problems affecting instruction. A significant proportion of these problems are associated with system and subsystem boundaries, or interfaces. The following are examples of problems that often plague instructional developers, and that may be avoided through adequate interface analysis and design:

- Gatekeeper rejection after an ID project is underway
- Client misinterpretation of ID project goals and activities
- Incongruities within a client organization
- Loss of momentum after initiation of a project
- Conflicting expectations within the client group
- Raids on resources previously committed to an ID project
- Unclear Client/Developer lines of responsibility and authority
- Difficulty in obtaining essential information

The function of interface analysis is to generate information needed to solve such problems, or at least to provide early warning of their potential danger to instructional development projects.

A more formal definition of interface analysis is "the identification, interpretation, and prioritization of essential points of contact among sys-

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tem and subsystem boundaries." As stated earlier, an interface may be physical, conceptual, or a combination of the two. Figure 9-1 illustrates the boundary or interface between two subsystems of a message-generating system, namely, a typist and a typewriter. The obvious functional points of contact between these two subsystems are eyes, fingers, and typewriter controls (i.e., keys, line-space knob, carriage release, ribbon reverse, space bar, etc.) Imagine these same two subsystems with the points of contact removed (Figure 9-2). Clearly, without these points of contact, there is no interface. Also worthy of note is the effect of impairment on one or more of these points, ranging from arthritic fingers to a fading ribbon.



Figure 9-1.
With interface.



Figure 9-2.
Without interface.

Other examples of physical interfaces are those among the components of an automotive transportation system. Two of those components are the driver and her/his automobile. Major points of contact for the interface between these two components or subsystems would include: eyes, hands, and feet as the human part of the interface; and ignition key, steering wheel, gear-shift, clutch, and brake pedal for the machine side. Again, the removal or impairment of any of the points of contact making up this interface may seriously reduce the effectiveness of the system. To gain a sense of the relative complexity among interfaces, compare the previous interface with the interface between a pilot and a 747, where there are over 2,000 points of contact between pilot and plane. To state the obvious, impairment of the points of contact in either system may result in a crash. It is worth considering that a significant number of ID projects also crash due to impairment of their interfaces.

Far more complex than physical interfaces, such as those described above, are social and organizational interfaces. Consider the possible interfaces within a large instructional development project. In Figure 9-3, a Venn Diagram is used to

show some of the interfaces involved in a project for developing a competency-based program in a college. Each of the outside circles represents a major component of the ID system, with the inner circle representing a common interface among the other components. Such a common interface is often labeled as the information handling or communication component of a system.

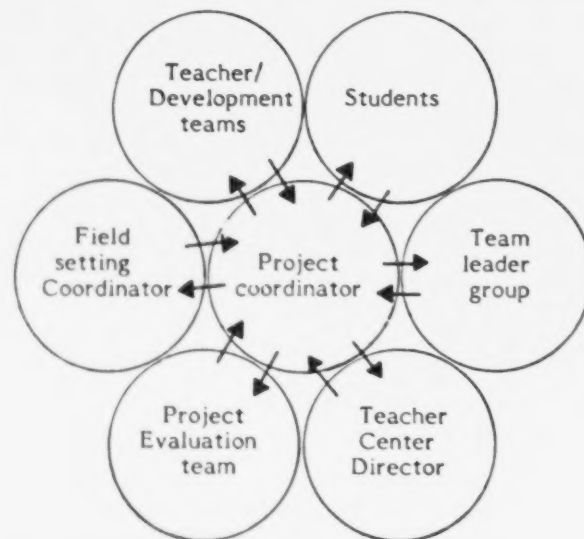


Figure 9-3. Components of an instructional development project.

THE STRUCTURE OF AN INTERFACE

A system may be defined as "a combination of interacting components that work in concert to accomplish a predetermined purpose." Given this meaning for system, components of a system, then, are dependent upon one another, and the operation of one may facilitate or inhibit the operation of another. The appropriate operation of these components in their common endeavor requires an exchange of essential information. As an example, the success of the ID project represented by the components depicted in Figure 9-3 depends upon an interchange of essential information between the project coordinator and each of the other groups involved. To some degree the same can be said about any pair of components in the system. Under this condition, interface analysis must have as one of its purposes the identification of essential information to be exchanged among the components of an instructional development system.

It is appropriate to point out the difference

between identifying and using existing interfaces within a system, as compared to designing or modifying interfaces to fit specific needs. The first is used most often by those instructional developers employing reactive management strategies, while the latter are processes illustrative of proactive strategies. Designing or modifying interfaces requires greater resources for their implementation, but usually provides greater effectiveness and efficiency than the former.

Over time, a whole range of tools and models from a variety of disciplines has been brought to bear on system interfaces, under a variety of labels. Not the least of these are communication models. One such model is presented in Figure 9-4. This is a variant on the Shannon-Weaver Communication Model (1964). Such models are useful for analyzing interfaces. That is, they may trigger such questions as, "what is the message being sent, who should be sending the message, is the appropriate mode being used to transmit the message, and is the message going to the appropriate receiver?" In addition, the use of these models may alert the analyst to such problems as message distortion (noise), redundancy, data gaps, and information overload.

Another discipline with concepts pertinent to the study of interface analysis is cybernetics (Wiener, 1961). Cybernetics is concerned with the investigation of communication and control, within and across systems. Specifically, cybernetics is the study of the coordination, analysis, storing, and control of data and information as such processes may affect the proper functioning of systems. These processes can occur efficiently within a system only if all subsystems are functioning properly in their own right, and if all subsystems are interacting properly. Proper functioning of these

systems depends to a large degree upon internal monitoring and the ensuing modification of system functions; this provides an operational meaning for the term "feed-back," a critical element in any system. The study of how feedback is produced, transmitted, utilized and lost within a system and between subsystems is called feedback analysis, and forms a major aspect of both cybernetics and interface analysis. More will be said of the function of interfaces in the regulation of feedback transmission, and its place in the management of a cybernetic device or structure will be discussed later.

TYPES OF INTERFACES

The reason for the existence of any interface is the exchange of essential information among systems or subsystems, and can range from a teacher responding to a student's question to a computer triggering a videotape. One way of classifying interfaces by type is by naming the generic nature of the two systems which are together producing the interface.

One type would be person-person, as in the case of the interface between a teacher and a student. Here the points of contact depend primarily upon speech and hearing apparatus, although other senses like vision and touch receive their fair share of information.

A second type would be person-machine. The typist-typewriter, driver-automobile examples, described earlier, fall into this class. Examples more relevant to instruction would be the interaction of teachers and students with instructional hardware (ex., television, slide-tape, etc.).

The third type of interface is machine-

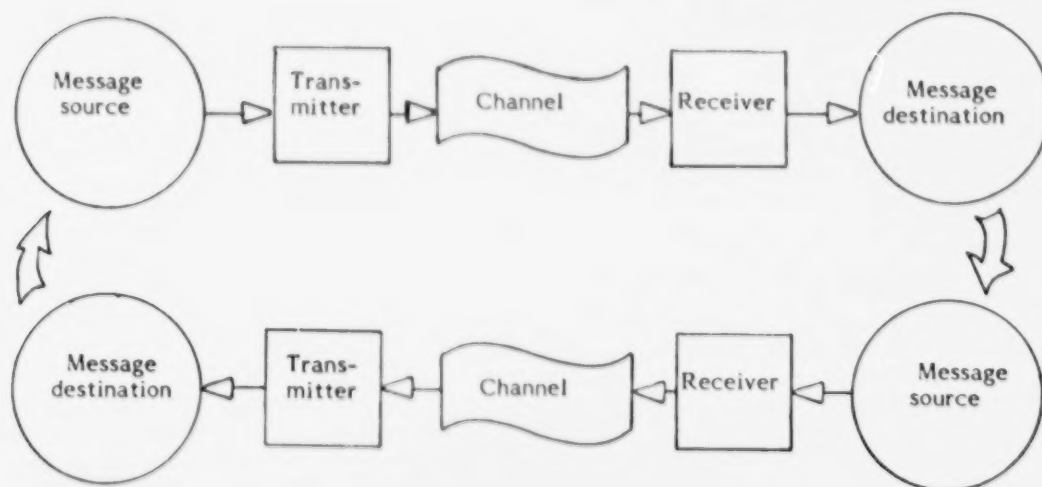


Figure 9-4. Modified Shannon and Weaver communication model.

machine. Common household examples would be the thermostat which turns a furnace on or off, and a recording device which can answer and record telephone messages. Machine-machine interfaces are less often found in instructional settings; where such an interface does exist in an instructional setting, it usually involves mechanical or electronic data-processing of some kind. Mechanical teaching machines and computer applications are the most common among these.

The importance of each of these types varies from setting to setting, depending upon its particular function in the instructional development project.

INTERFACE CHARACTERISTICS

There are certain general characteristics of interfaces which may be used to guide our analysis of them. A listing and a brief description of each of these characteristics follows:

1. **Permeability.** The ease with which information can travel across an interface from one component to another. The permeability of an interface may depend upon any number of factors. The organizational or administrative models controlling the interacting components is certainly a major factor. For example, a democratic administrative structure permits much freer access to and flow of information than does a militaristic administrative structure. Factors of language, values and culture may either inhibit or facilitate the exchange of essential information across an interface.
2. **Selectivity.** The constraints placed on access to information in a system or subsystem. The Great Wall of China, the Iron Curtain, government and corporate secrecy, privacy laws, all are indicative of systems which limit access to information. Knowledge of the rules which govern such access for client systems becomes necessary if instructional developers are to acquire the essential information to complete their tasks.
3. **Directionality.** The predominant direction in which information flows across an interface. The direction of information flow also depends to a large degree upon the administrative structures imposed upon an organization. In terms of models of administration, it is expected that information would flow primarily from the top down where militaristic models are used, and that information would tend to flow equally in both directions in democratic models. Early knowledge of the administrative model used by a client system could reduce false starts at acquiring information.
4. **Deprivation.** The effect on information flow resulting from inadequate resource

support for an interface. It is rare that interfaces have access to either sufficient resources or skills for insuring adequate information handling. As a result, the anemic condition of most interfaces affects the amount and quality of information which can be transported across an interface.

5. **Visibility.** The readiness with which an interface can be identified. In every organization there are both formal and informal communication and information-handling systems operating. Some of the most valuable are found among the informal; however, their identification is not always easy. Techniques for identifying informal liaisons and communication links are available.
6. **Stability.** The degree to which an interface is well-established and dependable in providing a consistent level of information. As a general rule, older systems have more stable interfaces, while newer systems have less stable ones. By the same token, interfaces of the former type are much more difficult to change than those of the latter type.
7. **Dependency.** Degree to which a system or subsystem depends for its survival on the information provided by other systems or subsystems. Some systems are relatively isolated from others, almost self-sufficient within themselves; while other systems are highly dependent on the information flowing across their various interfaces. Some systems are so dependent that the closing down of a single interface could render the system ineffective in some critical operation.
8. **Capacity.** The quantity of information that can travel across an interface in a prescribed amount of time. There are peak periods in any system when the information needs are greater than at other times. If the information is not delivered in the appropriate quantity at the appropriate time, then the system's effectiveness and efficiency may be seriously affected. Part of the problem, in many systems, is that there is poor discrimination between essential and non-essential information. The non-essential information tends to clog the interface, slowing the essential.

RELATION OF INTERFACE TO SYSTEM APPROACHES

So far, interfaces have been discussed as they relate to specific systems (i.e., message generation, transportation). The power of systems thinking is that all relationships can be viewed as the interaction of systems or subsystems. There are natural systems, and there are man-made systems.

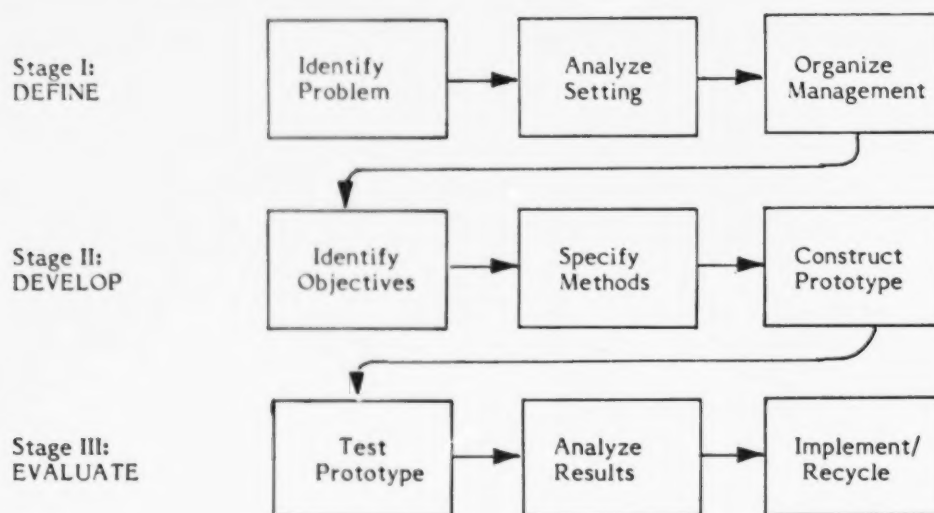


Figure 9-5. Instructional Development Institute systems approach model.

There are both physical and conceptual systems, and they may be arranged in a variety of combinations. They all have interfaces, or points of contact for exchanging essential information with other systems or subsystems. "System approaches" are special systems used by instructional developers to guide them through the process of developing instruction and concomitant organizational structures. Figure 9-5 is a graphic representation of one well-known systems approach (UCIDT, 1969).

This system is made up of a sequence of steps which instructional developers believe are essential for accomplishing their work. These steps may be viewed as "A complex plan or strategy which logically accounts for and relates in an orderly fashion: goals, behavior, instrumentation, and resources for the purposes of removing or reducing problems associated with the training or education of learners" (Educational Technology Glossary, 1977). One of the defining characteristics of a system is that the way in which one component functions affects how all of the other components of that system function. That is, how well a kidney functions determines how well other bodily organs function, or the timing of an automobile engine determines how well other engine components perform. So it is with system approaches. If we translate the components of the systems approach of Figure 9-5 into a Venn Diagram, as shown in Figure 9-6, we can get a better view of the important interfaces within this systems approach. The "Organize Management" component is made responsible for handling essential information required by the several components of the systems approach. Conceptually, it becomes the common interface for all of the interacting components.

The arrows, in this case, indicate essential information being transferred from one component to another, via the "organize management" component. The instructional development model depicted in Figure 9-6, then, can in turn interface with a client system and other related systems, as shown in Figure 9-7.

AN INTERFACE ANALYSIS MODEL

The flowchart in Figure 9-8 illustrates a prototype model of interface analysis. As more is learned about interface analysis, more sophisticated models are likely to emerge, but for our immediate purposes this model should serve as a conceptual frame for understanding interface analysis.

Steps one and fourteen of the model are provided for contextual purposes. Step two is concerned with the specification of the target system and any related systems which may be key to the instructional development project. Step two is carried out at some level for any ID project, but may require complex "systems analysis" techniques for more extensive projects. This step clarifies the boundaries of both the physical and conceptual systems that are likely to be involved in the ID project.

The third step in the process is to determine whether or not an instructional development project merits an interface analysis. Precise criteria for making that decision have not yet evolved, but elements such as size of the project, degree of support for the project, or number of people involved, give some direction. To say it another way, in those cases where the project is extensive, the number of people involved is large, and the

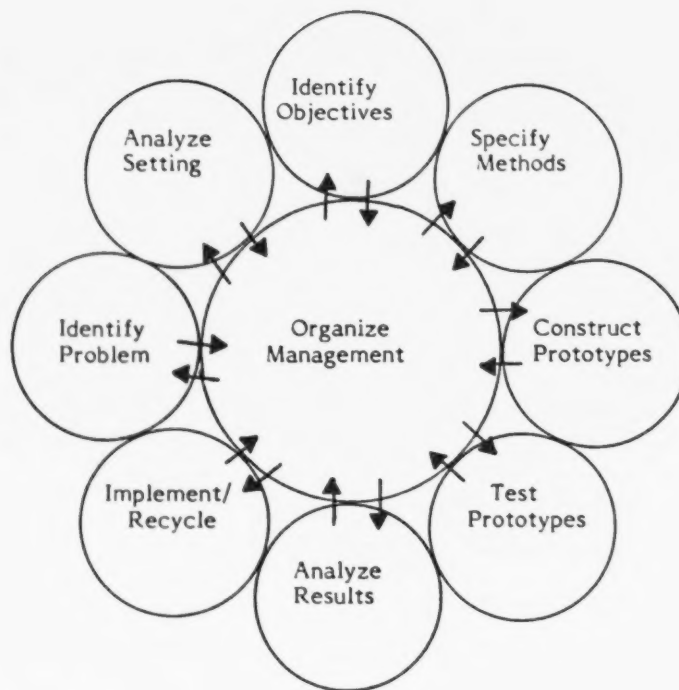


Figure 9-6. Venn diagram of a systems approach.

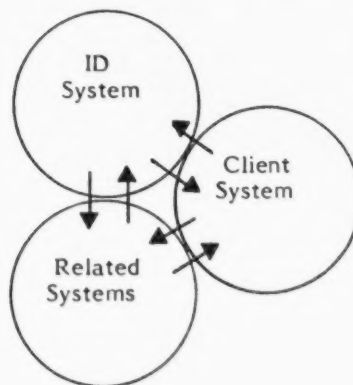


Figure 9-7. ID system interfacing with client and related systems.

resources are limited, interface analysis should be carefully considered. As a general rule, any time that a project represents a significant change in a system, it is wise to perform an interface analysis. That is, if the outcome to a project can be expected to have a critical affect upon individuals

within a system, then the acquisition of essential information in a useable form, at the appropriate time may well make the difference between acceptance and rejection for an ID project. Most instructional development requires people time as its major resource. Often, the large percentage of

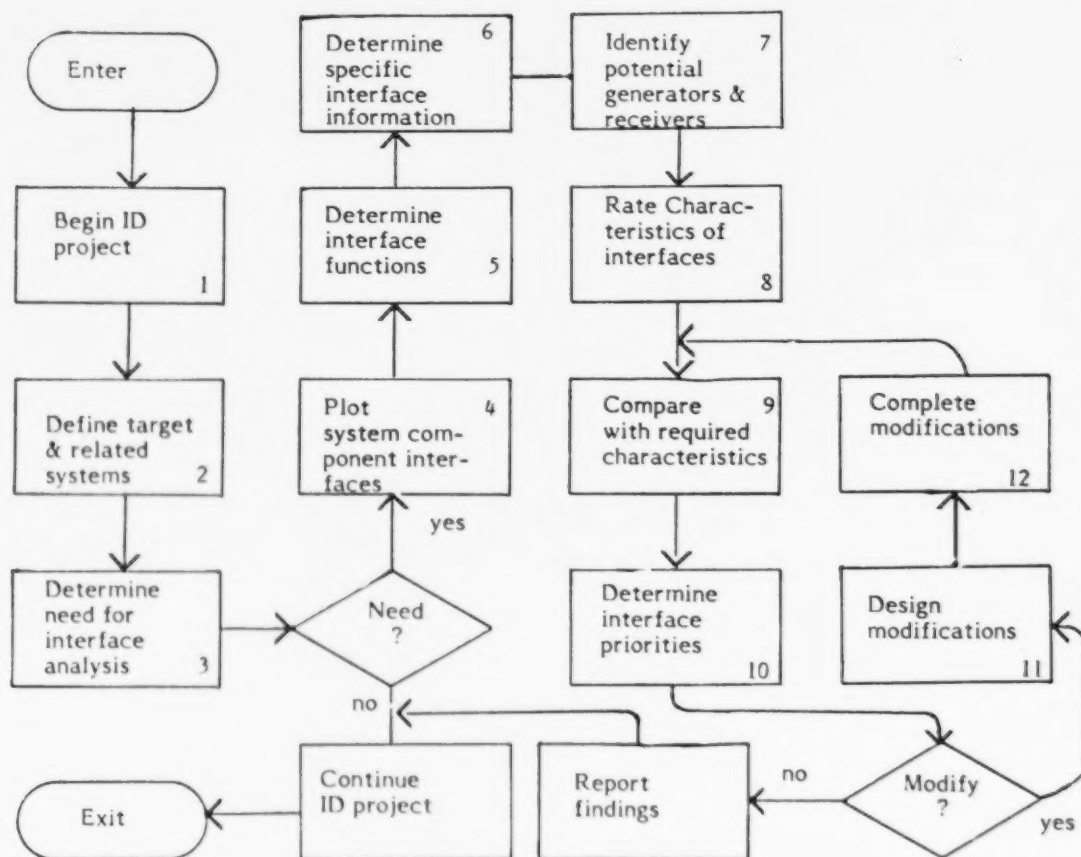


Figure 9-8. Iconographic model of interface analysis.

this time is available only in bits and pieces, because of other responsibilities of faculty involved in the instructional development project. The management of such fragmented time requires the collection and provision of much more information than in those cases in which the large percentage of a worker's time is dedicated to instructional development.

Given the identification of the system components in question and their function, specific interfaces can now be plotted, or identified. Graphically, these may be shown through Venn Diagrams as illustrated in Figure 9-6. This step (four) usually provides gross estimates of which boundaries should be considered. These interfaces are refined as the analyst specifies essential information required for the effective operation of the interacting components.

Given the state of the art, the determination of significant boundaries among subsystems and systems may be somewhat arbitrary. Usually, it is recommended that an analyst err in the direction of assuming that all components of a system or

subsystem need to exchange essential information with one another. The relative importance of a particular interface surfaces in the next step of our model.

The fifth step in the model deals with function analysis. Given the clear identification of specific systems and subsystems, this process asks, "what are the major functions of each?" Knowing the specific functions that an interface is expected to carry out assists the analyst, in step six, to determine the specific information required to support these functions. The outcomes of step six are the most critical to a project's success. Here, decisions are made as to the minimally essential information required for the effective and efficient operation of the system and subsystem components. Emphasis is placed upon "minimally essential" information. Information is a commodity that costs resources, and rarely are sufficient resources allocated for this purpose. Therefore, the acquisition of "nice-to-know" and other information not directly related to the project, needs to be excluded.

In step seven, the individual responsibility within the various components of the system are examined in order to determine logically what position or person would most reasonably be expected to generate the essential information needed by the components, and to determine what position or person would be expected to apply this essential information. As discussed later, logic does not always dictate who will be generators and receivers of essential information.

The eighth step is concerned with categorizing the identified interfaces according to the general characteristics described earlier (permeability, selectivity, etc.). This process basically identifies what is, rather than what should be. This represents the first serious look at the actual conditions under which the information network within a system really works. The analyst is aware (at least logically) of what essential information is required and who the generators and receivers should be. It is most unusual to find a one-to-one match between the intended and the actual information-handling and communication network.

In the ninth step, the analyst attempts to determine the performance potential for each interface. This is accomplished by comparing the minimally essential information required with the current level of the general characteristics of the interface. This part of the analysis is expected to show that some of the existing interfaces are adequate for the project purposes while others are not. Beyond that, the findings indicate which elements of the interface need modification.

The final step in the interface analysis process is for the analyst to prioritize the defective interfaces in terms of their criticality to the ID project. This can relate to both effectiveness and efficiency. This is used by project administrators and those responsible for interface modification in order to make their decisions.

With this background description, the reader should be prepared to consider an actual example of interface analysis.

AN EXAMPLE OF INTERFACE ANALYSIS

The following sections describe an example of an interface analysis carried out for a college undergoing extensive programmatic change. Because of space considerations, it is an abstracted version, highlighting the key elements of the setting and the analysis. This analysis will follow the steps in the model presented in Figure 9-8.

The Setting

The client institution involved in this analysis is a college of education whose leadership has embarked on an instructional and organizational development project designed to make major changes in the undergraduate teacher education program. The intent is to move from one basic program, which provides all teacher education students with identical experiences, to several alter-

native programs, each with a different emphasis. The contention of those favoring the movement is that the existing program is attempting to be all things to all people, and that in the limited preparation time permitted, its students are getting training that is "a mile wide, but only an inch deep." Their thought is that, given the differences among experts on what the curriculum should be, and given the differences among school districts in what they and their respective communities believe, it is valid to provide teacher education students with choices among curricula.

Not every faculty member of the college agrees that alternative programs are needed, and some seriously question the financial feasibility of having alternative programs. One of the alternative programs is the current program. A sufficient number of faculty members feel strongly that this generalist approach is appropriate for some students, in some settings. The alternative program emphases suggested are: subject-matter, heterogeneous groups, educational generalist, community of learners, and classroom management.

Target and Related Systems

An early step for any instructional development project, whether doing an interface analysis or not, is to identify any systems which may affect, or be affected by, the project.

The major components or subsystems identified in the undergraduate teacher education programs (UTEP) are shown graphically in Figure 9-9. These six components are: faculty, students, curriculum, instructional facilities, field settings, and the teacher-education administration.

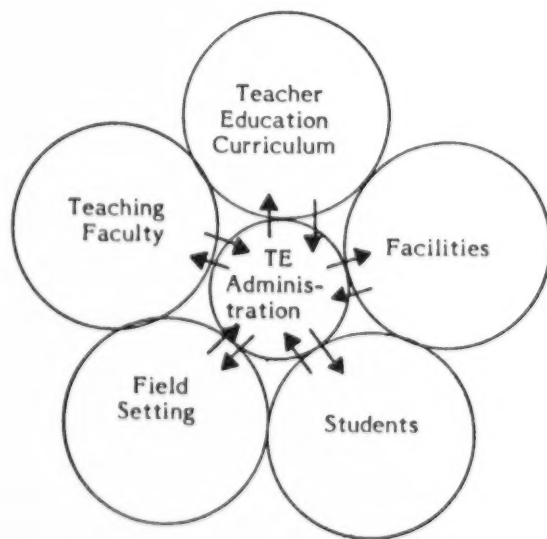


Figure 9-9. Undergraduate teacher education program.

culum is made up primarily of courses, including student teaching. The courses are taught by several departments, both in the college of education and in other colleges of the university. The curriculum for elementary education majors is somewhat different from that for secondary education majors. There are a large number of curricular areas in which students may earn minors.

Standard classrooms constitute most of the facilities required by the UTEP. In addition, there are self-instruction and curriculum production laboratories. The faculty, as in the case of the curriculum, are in several colleges. Elementary majors are responsible to the college of education, while secondary majors are responsible to the college in which their subject-matter curriculum is housed. Some courses, including student teaching, require field settings, which are mostly classrooms where students may go to practice and observe what they have been taught in the UTEP. The coordinating component, or teacher-education administration, is the responsibility of the director of the teacher-education division in the college of education. Since the diagram in Figure 9-9 is

limited to two dimensions, it only indicates the exchange of information between the five outside components with the teacher education administration component. It does not show the interface between faculty and student components, for example. To show all of these interfaces in a two-dimensional space, it would be necessary to have six different graphs, with a different component in the center each time.

Figure 9-10 shows the relationship of the undergraduate teacher education program (UTEP) to its related systems. They, too, provide essential information without which the system's effectiveness and efficiency could be impaired.

The State Department of Education, at another level, is a major policy-making and standard-setting agency for teacher education programs. As a responsive agency, its policies and standards change. The exchange of information between it and teacher education institutions is critical. At the national level, UTEP must be concerned with accrediting agencies such as the National Council for Accreditation of Teacher Education (NCATE). NCATE evaluation teams now visit each teacher education program in the United States once every

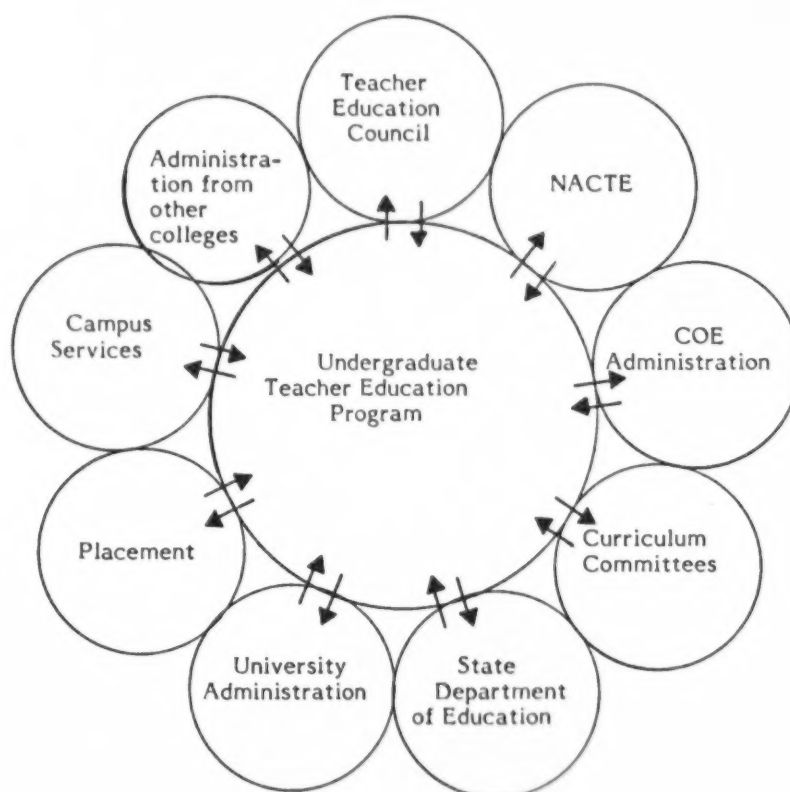


Figure 9-10. Systems related to the target system.

seven years. A teacher education program that fails to meet the minimal standards for such programs has sanctions placed against it which can only be removed by correcting all deficiencies. While information is not exchanged with NCATE on a regular basis, the exchanges which are made may be critical. The university administration and the board of trustees are ultimately responsible for programs on campus. With that responsibility comes authority manifested as general policy, but whose resource-allocation decisions invariably require justifying information from its programs. While the College of Education has primary authority for teacher education programs at the college level, it shares that authority with the administrators of other colleges which also provide instruction for UTEP. The primary agency through which they express that authority is the Teacher Education Council (TEC). TEC serves as a monitoring group which also sets policy for UTEP. Departmental, college, and university curriculum committees are gates through which any programmatic change must pass. The Placement Office serves as a clearinghouse for employment opportunities for the graduates and assists in hawking program wares among competitive markets. Campus Services, another important and useful subsystem of the teacher education system, includes student counseling services, evaluation services, instructional material services, the book store, the library, computer services, printing services, dormitories, and so on.

Identifying these related systems and subsystems was accomplished through a number of tech-

niques. Organization charts, university and college by-laws, and interviews with program administrators and faculty members were all common means.

Returning to the development of alternative teacher education programs (ATEP), it is necessary that a new (albeit temporary) system be designed, a program (instructional) development system. This system was installed to carry out the development of the alternative teacher education programs. Figure 9-11 breaks this system down into its most obvious subsystems. Five of the outside circles represent the instructional development teams, each responsible for one of the five alternative programs. The co-directors, two from each of the five alternative programs, make up the sixth component, the Alternative Program Team Co-directors. This component, along with the program development coordination component, represents the management aspect of the development process. Their mutual involvement is also designed to ensure that unnecessary duplication or gaps do not occur in the program.

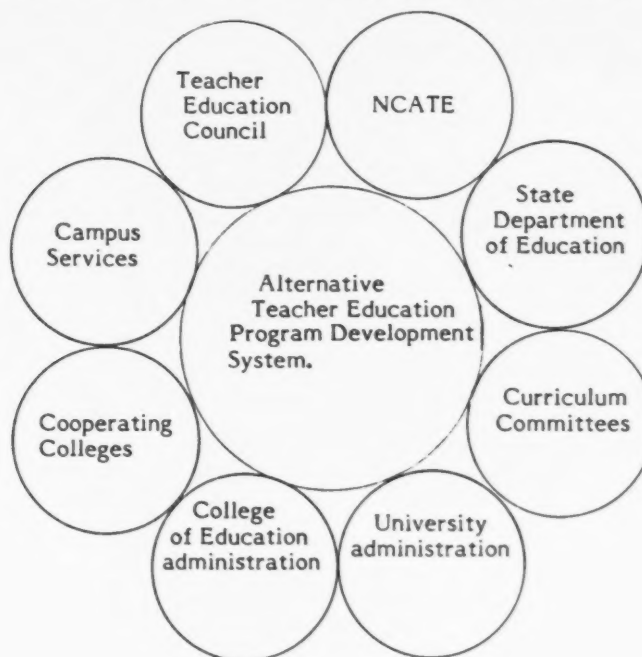
If the related systems for the Alternative Teacher Education Program Development System are examined (Figure 9-12), it is seen that they are very similar to those of UTEP in Figure 9-10. This should not be too surprising, given that the alternative teacher education programs would be expected to be responsible to the same policies as the current program.

The diagrams presented in the preceding figures have provided a systems map of the domain that instructional developers must consider as they proceed with this project. It is a broad sweep, and



Figure 9-11. Alternative teacher education program development system.

Figure 9-12. Systems related to the alternative TE program development system.



only shows the lay of the land, but it is sufficient to permit developers to take the next step.

Need for Interface Analysis

Keeping in mind that the purpose of interface analysis is to systematically determine minimally-essential information required by the systems and subsystems involved in the development, we can ask if, in this particular case, an interface analysis is worth doing? Using the broad criteria mentioned earlier, it would appear that an interface analysis would be useful. The project is extensive, affecting a large number of individuals in the target and related systems, of whom a respectable number are not yet convinced of the value of the project. Also, the resource level for this development is minimal, requiring careful coordination of the time that faculty members and others have to give to the project. The management of fragmented time requires far more information in order to maintain development momentum than does management of dedicated time. Long delays, caused by a lack of information when it is needed, does much to reduce the enthusiasm of participating faculty.

Interface Plot

The plotting of interfaces is accomplished by expanding the Venn Diagrams in Figures 9-9, 9-10, 9-11, and 9-12 so that in each case the relationship of each component to all of the others is shown.

For example if, in Figure 9-12, the middle component switched places with the university administrator component, then we would consider all possible combinations of information exchange between the university administration component and the other components making up the diagram.

Interface Functions

At this point, the interface analysis examines the functions of each pair of components as they related to the instructional or program development project. It is not necessary or efficient to consider every function each component might be responsible for, since many of their functions have little or no relevance to the project. In fact, in some cases the analyst will find it useful to only be concerned about selected data for a specific function. For example, the university administration functions of most concern are those of policy making and resource allocation. But the interface analyst will only be interested in those policies and budget matters which may affect the project. The guiding question is, "what functions of this component could or should affect project outcomes?" To give one other example, the major curriculum committee function is to compare all course or program proposals with a set of established criteria, and to either accept or reject the proposal depending on how well it meets those criteria. In the case of this institution, there are four different committees through which curricu-

lum proposals pass, all with somewhat different criteria for passage. Departmental, college and university by-laws usually spell out these functions quite clearly.

Minimally-Essential Information

The analyst now translates the component functions into a description of the "must have" information needed by other components of the project in order for them to do their tasks well, and determines what essential information that same component requires in order to best serve the needs of the project. To make this clearer, consider the curriculum function mentioned in the previous section--"to compare all course or program proposals with a set of established criteria, and to either accept or reject the proposal depending on how well it meets the criteria." What is the bare-bones information needed by the project from these curriculum committees? Below is a partial list of the items of information which the director of this project needs in order to interface effectively and efficiently with the curriculum committees:

1. course and program criteria considered important by the curriculum committees
2. procedures and forms for submitting proposals
3. level of detail required by the curriculum committees
4. contact person(s) on the curriculum committees
5. amount of lead time required by a committee to consider a proposal.
6. schedule of regular meetings of the committee
7. procedure for challenging a curriculum committee decision

In turn, the analyst determines the essential information needed by each of the four committees, and what components would be responsible for generating that information. Below are examples of information items expected by all of the committees, but on a different level for each:

1. assurance that necessary resources for developing and maintaining the system are available
2. advantages to the unit represented by particular curriculum committees
3. assurance that territory of other unit members is not being pre-empted
4. experimental nature of the program
5. evidence that the program meets required criteria

Information Generators and Receivers

The next task of the interface analyst is to determine what individual or individuals would actually be expected to generate the essential information, and who would be expected to receive it (i.e., use it). A number of techniques are used to identify these individuals. For instance, examina-

tion of organizational structure and committee memberships, or directly asking unit members involved, were some of the methods used. In one situation, where it was critical to understand both the formal and informal communication network, a modified network analysis (Farace, Russell, and Monge, 1974) was performed. This is a powerful tool for very quickly identifying the operating communication network in a system, which invariably is dependent on informal elements as well as those designated by the system. This technique very rapidly identifies communication groups within the system, and of greater value to the instructional development project, it pinpoints who is dependent on whom for information. Often it is found that formally designated generators and receivers in a system are not the ones who do the work or handle the essential information. The technique also identifies liaisons and bridge links, individuals who for any number of reasons are in a position to best distribute information to several groups or individuals in the system, or, for that matter, to receive information from a number of sources. These individuals are valuable for other instructional development processes as well, such as assisting in the diffusion of innovations.

Interface Characteristics

It is necessary to identify the generators and receivers of essential information, since they are a critical part of the interface, before actually rating the characteristics of the interfaces. These characteristics are: permeability, selectivity, directionality, deprivation, visibility, stability, dependency and capacity. They are described in an earlier section of this chapter.

The curriculum committee component in Figure 9-12 will be used to illustrate the rating of the characteristics of an interface. Two major factors determine the rating (in terms of effectiveness and efficiency) of the characteristics of a particular interface. These are the structural mode of communication used and the personal qualities of the generators and receivers of information. The formal and informal structural modes for communicating information are those means used by the interacting systems or subsystems for that purpose. In this project, the usual communication modes were used, including: face-to-face, memo, telephone, written reports, up to and including computer read-outs. These modes were looked at both in terms of effectiveness and efficiency. As examples, in those instances where records were needed, face-to-face or telephoning was not effective. The time-lag resulting from using campus or other mail systems for delivering memos or reports was found to reduce the efficiency of the instructional development. The personal qualities of generators and receivers that could affect the characteristics of the interfaces include attitudes toward the project and its personnel and the respective communications and information-handling skills of the generators and

receivers. In terms of the latter, these skills (or the lack of them) affect the attributes of the information in terms of accuracy, completeness, relevancy, and timeliness (Hussain, 1973). In regard to attitudes, if receivers do not trust the source of the information, they often do not use it. By the same token, when the generator (or possessor) of the information views either the project or the receivers of the information antithetically, s/he is hesitant about sharing that information. It

is not unusual in a project to discover that individuals needing the information (receivers) have worked out alternative ways to get the information, and ignore the formally established procedure. As often as not, the reason may be traced to a lack of trust in the generator of the information. S/he is perceived by the receiver as being negative toward the project, or toward the receiver, or even being incompetent. In other cases information is not used because it arrives too late or because it is

Figure 9-13. Sample rating report on characteristics of an interface.

<u>Characteristic</u>	<u>Rating</u>
1. Permeability	I
a. information required would necessitate a change in their computer program.	
b. They don't want to make the change out of concern for having to provide the same service for others.	
2. Selectivity	I
a. They are concerned that they may be liable to privacy laws, if they give us the information.	
b. They were not able to show the section of the privacy law that legislated against their providing this information.	
3. Directionality	I
a. Their practice has been to send out information that they see as valuable, rather than to respond to requests.	
4. Deprivation	S
5. Visibility	S
6. Stability	S
7. Dependency	I
a. It is very necessary to identify these students.	
b. The information will continue to be needed on a regular basis, even after development is complete.	
c. The assistant director is sympathetic to the need.	
8. Capacity	S

provided in an unfamiliar or inappropriate format. Even when care is taken, these problems often do not surface until sometime later, when those responsible for the instructional development are trouble-shooting project slowdowns. Eventually, it becomes necessary to set up a monitoring system that periodically checks the level of the characteristics for an interface.

The rating scale used for each of the characteristics is relatively primitive. An "S" indicates that a particular interface characteristic is at a sufficient level, and an "I" is used when the characteristics falls below the desired level. Accompanying the "I" is an explanation of why the interface falls below the desired level. Figure 9-13 is a sample of an interface rating. Note that four of the characteristics are rated "insufficient," while the rest are rated "sufficient." There is an attempt to keep the explanation for these deficit characteristics factual, and to avoid offering solutions.

Comparisons

In Step 9 of the Interface Analysis Model, the analyst assesses the capability of each interface (in its present state) to provide the necessary information at the desired level of effectiveness and efficiency. In the case of the example provided in Figure 9-13, extensive modification is required before it can perform satisfactorily. Considering the list of defective interfaces only, there is considerable variance in the amount of modification required for each. On the positive side, the larger number of the desired interfaces for the system are already in place, and are rated as satisfactory for project purposes without change.

Interface Priorities

This step is limited to considering only the interfaces which require modification. Some of the proposed modifications require extensive resources (in a system where resources are difficult to come by), and completion of them is projected to consume a great deal of time. The amount of resources and time required in such projects is often difficult to predict. In most cases, the analyst simply gets agreement from significant others on the strategy most likely to be used in changing the interface, and then provides resource and time estimates for that strategy. In addition, the interfaces are ranked in terms of their importance to the project. In a sense this final ranking is a final test of the analyst's conviction that the information identified is the "minimally essential information" required to do the job.

Step Ten ends the interface analysis part of the process. The data from this analysis is then used by decision-makers to decide whether to modify, or how much to modify, a given interface. In a few instances, project leaders may decide to develop entirely new or parallel interfaces. In the case of the interface in Figure 9-13, the necessary modifications will eventually be made, but at a cost of considerable energy and time.

CONCLUSION

Some form of interface analysis has always been used by instructional developers, whether they called it that or not. The question remaining is whether the systematic analysis of interfaces among system and subsystem components is a valid way for determining, in a proactive way, the essential information required to carry out instructional development. Few disagree about its value on a logical basis, and those taking part in the limited application of models such as the prototype described here indicate a savings in energy and time. However, the value of interface analysis toward solving an ancient system's problem will not be determined until its processes has been refined and objectively tested in a broader range of settings.

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